THE JOURNAL

—OF THE—

5-4799

FRANKLIN INSTITUTE,

DEVOTED TO

SCIENCE AND THE MECHANIC ARTS.

EDITED BY

Prof. Edwin J. Houston, A.M., Ph.D., Chairman; Prof. Arthur Beardsley, C.E., Ph.D., Mr. Theo. D. Rand, Prof. Coleman Sellers, E.D., Mr. J. C. Trautwine, Jr., Committee on Publications, with the Assistance of Dr. Wm. H. Wahl, Secretary of the Institute.

VOL. CXL.—Nos. 835-840.

JULY-DECEMBER, 1895.

PHILADELPHIA:

Published by the Institute, at the Hall, 15 South Seventh Street.

1895.

THE JOURNAL

OF THE

FRANKLIN INSTITUTE,

DEVOTED TO

SCIENCE AND THE MECHANIC ARTS.

EDITED BY

JULY-DECEMBER 1904.

JOURNAL OF THE FRANKLIN INSTITUTE.

Vol. CXL.—July-December, 1895.

INDEX.

Air-lift pump, theory of the. (Harris) 32
Aldrich, Wm. S. Education and the State university 262
American tools in England 76
Ammeter and voltmeter, recording. (Hering) 463
Anaglyph, the. A new method of producing the stereoscopic effect. (Watch) 401
Argon, physical properties of 314
reasons for predicting the existence of. (Reed) 68
Artificial silk 78
Asphalt. (*See* Sadtler, Day and Peckham.)
Asphalts and bitumens. (Sadtler) 198
on the technical analysis of. (Sadtler) . . . 383

Bacteriology, recent advances in, etc. (*See* Ball.)
Ball, M. V. Recent advances in bacteriology, with special reference to food 340
Ball nozzle, the. (Kitson) 123
Beet sugar industries 79
Bergami, F. The citrate method of phosphoric acid determination, with special reference to insoluble phosphates 139
Berliner, Emile. Technical notes on the gramophone 419
Bitumen. (*See* Peckham.)
Bitumens. (*See* Asphalts.)
Brass, determining the quality of, by color 391
Buoys, electrically-lighted, in Gedney Channel, New York Harbor . . . 313
Book Notices:
Pray. Steam tables and engine constants 159
Sellers, Wm. & Co. Illustrated catalogue, etc. 316
Kiersted. Sewage disposal 317
Buchanan. Antisepsis and antiseptics 317
Beard. Ventilation of mines 318
Nernst-Borchers. Jahrbuch der Elektrochemie 318
Encyclopedie des Aide-Memoire 319, 394
Rothwell. The mineral industry, 1894 319
Yeo. Steam and the marine steam engine 394
Langmaid-Gaisford. Marine steam engine 394
Seaton. Marine engineering 395
Peabody. Valve gears 397
Siebel. Mechanical refrigeration 398
Kent. Mechanical engineer's pocket-book 399
Chronicle fire tables, 1895 399
Johnson. Engineering contracts, etc. 481

Canal, Chicago drainage 238
the new Canadian "Soo" 152
Carbides of iron. (Garrison) 464
Carpenter, R. C. Force required for driving and pulling cut and wire nails 387
Castner's electrolytic process for chlorine and alkali 386
Cellulose protection for war vessels, etc. (Wiltberger) 53
Cement mortar mixed with various kinds of sand, tests of. (*See* Cooper, A. S.)
Chicago drainage canal and lake commerce 238
Citrate method of phosphoric acid determination, etc. (Bergami) . . . 139
Cooper, A. S. Tests of cement mortar mixed with various kinds of sand 321
Cooper, John H. An account of the Gardiner Lyceum, the first trade school in America 275
A simple and effective shaft coupling 392
Coupling, shaft, a simple and effective 392

Day, Wm. C. Investigation of Utah gilsonite, a variety of asphalt . . 221
Delany's system of fast telegraphy 472
Durfee's hydraulic vacuum pump and blowpipe 311

Electric heaters, prize for 314
locomotive, successful trials of 240
railway, test of an. (Johnston) 135
tests, some notes on. (Hering) 462
railways in the United States 157
Electrically lighted buoys in Gedney channel, New York Harbor . . . 313
Electricity *vs.* steam on railroads 158
Electrolytic process (Castner's) for chlorine and alkali 386
Electrolysis, an apparently new observation in 153
Electroplating, metallic lactates in 480
Electro-metallurgy as applied to silver refining, etc. (Faunce) 287
Engineering education and the State university. (Aldrich) 262

Faunce, George. Electro-metallurgy as applied to silver refining, and incidentally to other metals 287
Fender, the "deadly" trolley car 240
Fire-alarm system, the pneumatic. (Report of the Committee on Science and the Arts) 81
Flexure of beams, an apparatus for experimenting with the laws of. (Greenleaf) 27
Forests, Pennsylvania. (Rothrock) 105
Formulæ for the calculation of wires. (Keller) 455

FRANKLIN INSTITUTE:
Committee on Science and the Arts:
Report on the pneumatic fire-alarm system 81
Report on the Pelton water-wheel 161
Proceedings of stated meetings, June, September, October, November, 1895 . . . . . 80, 320, 400, 482
State Weather Service:
Monthly bulletins and maps. (July *supplement.*)

Gardiner Lyceum, first trade school in America. (Cooper) 275
Garrison, F. L. Carbides of iron 464
Gerhard, Wm. Paul. Sanitary engineering 56, 90
Gilsonite, Utah, investigation of. (Day) 221
Gramophone, technical notes on the. (Berliner) 419
Greenleaf, James L. An apparatus for experimenting with the laws of flexure of beams 27
Grimshaw, Robert. Tests of rotary snow-shovels 477
The Köpcke spring rail-joint 478

Hering, Herman S. Recording ammeter and voltmeter 463
Some notes on electric railway tests 462
Hill, Nathaniel. Having the logarithms of two numbers, to find the log. of their sum or difference 130
Hydraulic vacuum pump and blowpipe. (Durfee) 311

Ice, on the growth and sustaining power of. (Vedel) 355, 437
Indirect electrolysis. (Andreoli) 153
Interstitial space. (Paret) 117
Iron, prospective increase in the consumption of 478
Irrigation: with an example of its application, etc. (Wyckoff) 241

Johnston rail-bond 464
Johnston, A. L. Test of an electric railway 135

Keller, Edwin R. Some formulæ for the calculation of wires 455
Kent, Wm. Some preventable wastes of heat in the generation of steam 406
Kitson, Arthur. The ball nozzle 123

Lactates, metallic, for electroplating 480
Logarithms. Having the logarithms of two numbers, to find the log. of their sum or difference. (Hill) 130
Locomotive, electric, successful trials of 240

Mabery, Charles F. Composition of the American sulphur petroleums 1
Magnetic properties of iron, nickel and magnetite at different temperatures 157
Mason, Wm. P. Rainfall and typhoid fever 212
Microscope, illumination of opaque objects for examination 480
Mineral production of the United States, 1893-94 79
Mineral statistics (British), 1894 391

Nails, comparative tests of wire and cut. (Carpenter) 387

Paret, T. Dunkin. Interstitial space 117
Peckham, S. F. What is bitumen? 370
Pelton water-wheel. (Report of the Committee on Science and the Arts) 161
Petroleums, American sulphur, composition of. (Mabery) 1
Phosphoric acid determination, the citrate method of, etc. (Bergami) . 139
Pneumatic fire-alarm system. (Report of the Committee on Science and the Arts) 81
Prizes for electric heaters 314
offered by the Institution of Civil Engineers, London 320

Rail-bond. (Johnston) 463
Rail-joint, the Köpcke 478
Railroads of the United States in 1894 389
Railway, electric. (*See* Hering.)
test of an (Johnston) 135
trans-Siberian 480
Railways, electric, in the United States 157
Rainfall and typhoid fever. (Mason) 212
Recording ammeter and voltmeter. (Hering) 463
Reed, C. J. Reasons for predicting the existence of argon 68
Richards, Joseph. Aluminium solders 351
Rothrock, J. F. Our Pennsylvania forests 105

Sadtler, S. P. Asphalts and bitumens 198
On the technical analysis of asphalts 383
Sanitary Engineering. (Gerhard) 56, 90
Self-propelling vehicles 309
Silk, artificial 78
Snow-shovel, rotary, the Scheffler-Kurth 477
Sodium, metallic, from leakage currents 315
Solders for aluminium. (Richards) 351
"Soo" canal, the new Canadian 152
State Weather Service, bulletins and maps. (*See* July *supplement*.)
Stereoscopic effect, a new method of producing the anaglyph. (Watch) 401
Sulphur petroleums, American, composition of. (*See* Mabery.)

Technical notes 155, 480
Telegraph, electric, future of the 472
Telegraphing without wires 237
Test of cement mortar mixed with various kinds of sand. (A. S. Cooper) 321
Theory of the air-lift pump. (Harris) 32
Tin-plate production in the United States 479
Trade school, the first to be established in America. (*See* Cooper, J. H.) 275
Trans-Siberian railway 480
Trolley car fender 240
cars as life-savers 77
Typhoid fever. (*See* Rainfall) 212

Vedel, P. On the growth and sustaining power of ice 355, 437
Voltmeter and ammeter, recording. (*See* Hering.)

Wastes of heat, some preventable, in the generation of steam. (Kent) . 406
Watch, Alfred F. The anaglyph : a new method of producing the stereoscopic effect 401
Water-wheel, Pelton, report on 161
Wiltberger, B. P. Cellulose protection for war vessels, etc. 53
Wires, some formulæ for the calculation of. (Keller) 455
Wyckoff, A. B. Irrigation : with an example of its application in the arid region of Western America 241